

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION  
RESEARCH AND TECHNOLOGY RESUME

TITLE  
Occultation Studies of the Solar System  
NASA Grant NSG-7603

PERFORMING ORGANIZATION  
Lowell Observatory  
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DESCRIPTION (a. Brief statement on strategy of investigation; b. Progress and accomplishments of prior year; c. What will be accomplished this year, as well as how and why; and d. Summary bibliography)

**a. Strategy.** Occultations of stars by planets, satellites, planetary ring systems, asteroids, and comets provide valuable opportunities to probe the Solar System in ways otherwise impossible from the surface of the Earth. For example, one can precisely measure the size and shape of objects which are much too small to be resolved directly, accurately map the structure and transparency of ring systems, and detect the faintest trace of an atmosphere. In this investigation, we identify upcoming occultations through wide-ranging computer searches, provide accurate predictions for the more important events, and observe selected occultations with our specially designed portable photometric equipment.

**b. Accomplishments.** During the past year, we produced accurate predictions for an occultation of AG+40°0783 by 324 Bamberga on 8 December 1987 and coordinated efforts to observe this event. The occultation was successfully observed at 13 sites including two manned by Lowell Observatory astronomers. We presented a preliminary analysis of the data at the Asteroids II Conference held in Tucson in March 1988. We also have devoted a lot of time to producing an accurate prediction for the 9 June 1988 occultation of a star by Pluto. Prediction of this important occultation is complicated by the presence of Pluto's satellite, Charon. We have worked closely with astronomers at MIT, Lick Observatory, and the U.S. Naval Observatory, in the application of a variety of astrometric approaches to this problem. If the occultation is successfully observed, there will be a major advance in our knowledge of the most distant planet. Finally, Millis, in collaboration with Dr. David Dunham, has recently completed a lengthy review paper on occultation studies of asteroids.

**c. Expected Accomplishments.** Next year we expect to complete an analysis of existing observations of occultations by the asteroids 47 Aglaja and 324 Bamberga. We expect to participate fully in the analysis of observations of the 9 June Pluto occultation, should we or our collaborators succeed in observing it. Additionally, 1989 will be a banner year for occultation observers, with outstanding occultations involving Saturn, Vesta, Ceres, Kleopatra, Bamberga, and Brixia predicted to occur. We intend to observe most, if not all of these. The Saturn occultation provides an opportunity to probe that planet's rings with a resolution approaching that achieved by the *Voyager* spacecraft. Kleopatra is believed, on the basis of radar observations, to be extremely elongated. Occultation observations can check that result. Vesta is the one remaining asteroid whose mass is well known, but whose size is not. We plan to measure the size and thereby determine Vesta's density, which in turn gives a direct clue to this unusual asteroid's composition.

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